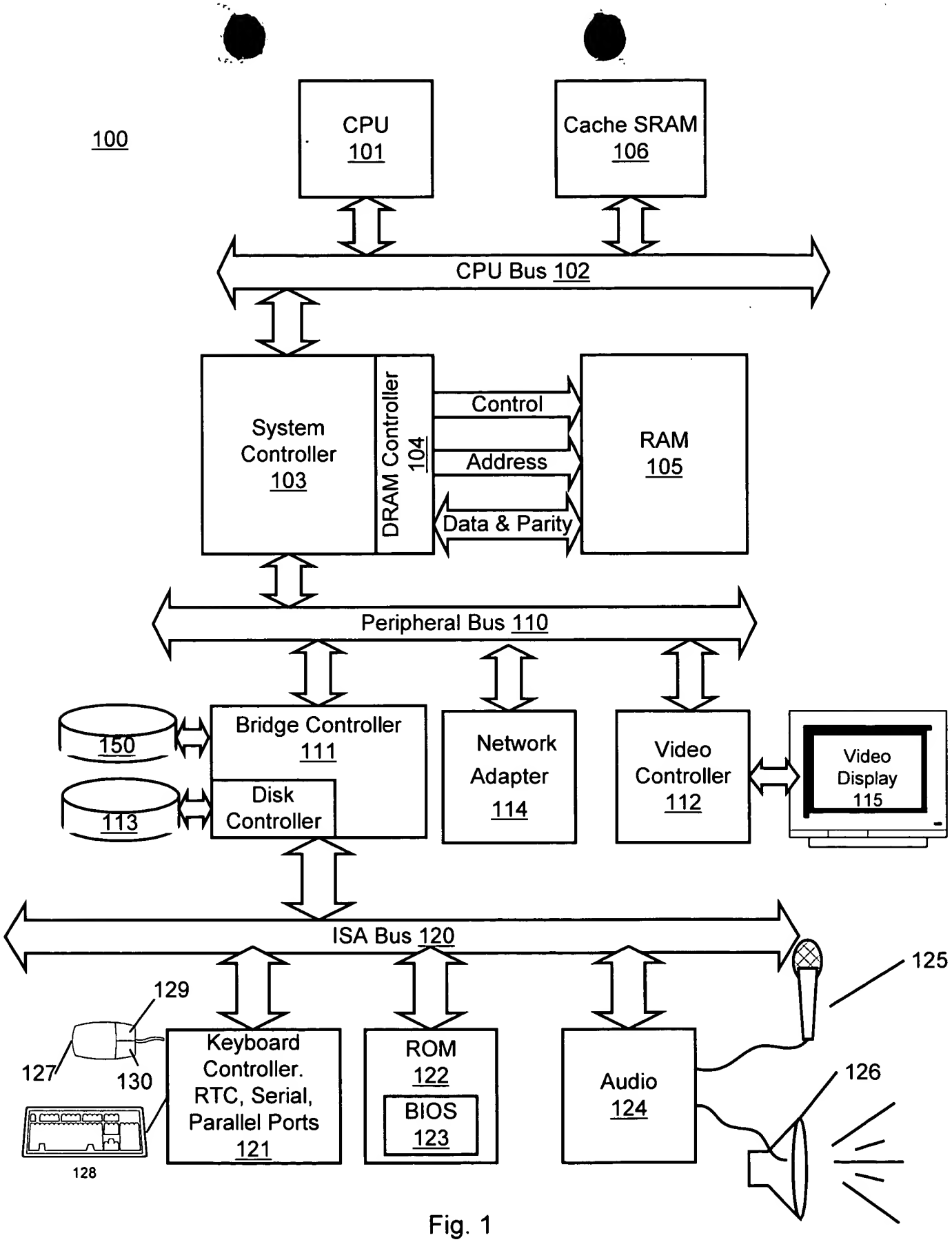
100
CPU
101
Cache SRAM
106
CPU Bus 102
System
Controller
103
DRAM Controller
104
Control
Address
Data & Parity
RAM
105
Peripheral Bus 110
150
113
Bridge Controller
111
Disk
Controller
Network
Adapter
114
Video
Controller
112
Video
Display
115
ISA Bus 120
125
129
127
130
128
Keyboard
Controller.
RTC, Serial,
Parallel Ports
121
ROM
122
BIOS
123
Audio
124
126

Fig. 1

Traditional Class A System (no parallel commands)

User	Commands
1) Select "Extrapolation" command.	➢ Activate "Extrapolation" command.
2) Select patch 1.	➢ Mark patch 1 for extrapolation command.
3) Extrapolate patch 1 (dynamic interactive) by moving the extrapolation handle to the left, until the result satisfies.	For each dynamic step on modification of patch 1 do: ➢ Extrapolate
4) Select Matching command.	➢ Activate Matching command.
5) Select patch 2 as modified patch with neighbor edge to patch 1.	➢ Mark patch 2 for Matching as modification patch.
6) Select patch 1 as reference patch with neighbor edge to patch 2.	➢ Mark patch 1 for Matching as reference patch.
7) Adjust matching parameter (deactivate partly, inverse direction)	
8) Activate Matching.	➢ Match
9) Select Control Point command	➢ Activate "Control Point" command.
10) Select patch 2.	➢ Mark patch 2 for "Control Point" command.
11) Move third control point row of patch 2 (dynamic interactive) using one of the line segments of the control point mesh handle, until the following matching will satisfy (this is a guess).	For each dynamic step on modification of patch 2 do: ➢ Adjust control points.
12) Select Matching again.	➢ Activate Matching command.
13) Select patch 2 as modified patch with neighbor edge to patch 1.	➢ Mark patch 2 for Matching as modification patch.
14) Select patch 1 as reference patch with neighbor edge to patch 2.	➢ Mark patch 1 for Matching as reference patch.
15) Activate Matching.	➢ Match
Repeat step 9 and 15 until result satisfies.	

Fig. 2

Class A System with parallel commands

User	Main Command, Slot
1) Select "Control Point" command.	➢ Include "Control Point" command into the active command table. ➢ Activate "Control Point" command.
2) Select patch 1.	➢ Include patch 1 into geometry table (slot) and mark it for active command "Control Point". ➢ Send "Update 3D Handles" notification to "Control Point" command.
3) Select patch 2.	➢ Include patch 2 into geometry table (slot) and mark it for active command "Control Point". ➢ Send "Update 3D Handles" notification to "Control Point" command.
4) Select Matching command.	➢ Include Matching command into the active command table. ➢ Activate Matching command.
5) Select patch 2 as modified patch with neighbor edge to patch 1.	➢ Mark patch 2 in geometry table for active command Matching as modification patch. ➢ Send "Update 3D Handles" notification to Matching command.
6) Select patch 1 as reference patch with neighbor edge to patch 2.	➢ Mark patch 1 in geometry table for active command Matching as reference patch. ➢ Send "Update 3D Handles" notification to Matching command.
7) Select Extrapolation command.	➢ Include Extrapolation command into the active command table. ➢ Activate Extrapolation command.
8) Select patch1.	➢ Mark patch 1 in geometry table for active command Extrapolation. ➢ Send "Update 3D Handles" notification to Extrapolation command.
9) Extrapolate patch 1 (dynamic interactive) by moving the extrapolation handle to the left, until the result satisfies.	For each dynamic step on modification of patch 1 do: ➢ Check all commands marked on patch 1: • Found Matching. ▪ Send "Update 3D Handles" notification to Matching. • Found "Control Point Modification". ▪ Send "Update 3D Handles" notification to "Control Point Modification". • Found Extrapolation. ▪ Send "Update 3D Handles" notification to Extrapolation. ➢ Finish dynamic step.
10) Activate Matching by clicking on the matching handle	➢ Check all commands marked on patch 2: • Found Matching. ▪ Send "Update 3D Handles" notification to Matching. • Found Control Point Modification. ▪ Send "Update 3D Handles" notification to "Control Point".
11) Move third control point row of patch 2 (dynamic interactive) using one of the line segments of the control point mesh handle, until the following matching will satisfy (this is a guess).	For each dynamic step on modification of patch 2 do: ➢ Check all commands marked on patch 2: • Found Matching. ▪ Send "Update 3D Handles" notification to Matching. • Found Control Point Modification. ▪ Send "Update 3D Handles" notification to "Control Point". ➢ Finish dynamic step (patch 2 already handled).
12) Activate Matching again by clicking on the matching handle	➢ Check all commands marked on patch 2: • Found Matching. ▪ Send "Update 3D Handles" notification to Matching. • Found Control Point Modification. ▪ Send "Update 3D Handles" notification to "Control Point".
Repeat step 11 and 12 until result satisfies.	

Fig. 3

Class A system with parallel and associative commands

User	Main Command, Slot
1) Select "Control Point" command.	➢ Include "Control Point" command into the active command table. ➢ Activate "Control Point" command.
2) Select patch 1.	➢ Include patch 1 into geometry table (slot) and mark it for active command "Control Point". ➢ Send "Update 3D Handles" notification to "Control Point" command.
3) Select patch 2.	➢ Include patch 2 into geometry table (slot) and mark it for active command "Control Point". ➢ Send "Update 3D Handles" notification to "Control Point" command.
4) Select Matching command.	➢ Include Matching command into the active command table and mark it as associative command. ➢ Activate Matching command.
5) Select patch 2 as modified patch with neighbor edge to patch 1.	➢ Mark patch 2 in geometry table for active command Matching as modification patch. ➢ Send "Update 3D Handles" notification to Matching command.
6) Select patch 1 as reference patch with neighbor edge to patch 2.	➢ Mark patch 1 in geometry table for active command Matching as reference patch. ➢ Send "Update 3D Handles" notification to Matching command.
7) Select Extrapolation command.	➢ Include Extrapolation command into the active command table. ➢ Activate Extrapolation command.
8) Select patch1.	➢ Mark patch 1 in geometry table for active command Extrapolation. ➢ Send "Update 3D Handles" notification to Extrapolation command.
9) Extrapolate patch 1 (dynamic interactive) by moving the extrapolation handle to the left, until the result satisfies.	For each dynamic step on modification of patch 1 do: ➢ Check all commands marked on patch 1: • Found Matching (associative). ▪ Activate Matching Action. ▪ Mark Patch 2 as modified (by Matching). ▪ Send "Update 3D Handles" notification to Matching. • Found "Control Point Modification". ▪ Send "Update 3D Handles" notification to "Control Point Modification". • Found Extrapolation. ▪ Send "Update 3D Handles" notification to Extrapolation. ➢ Look for patches modified by associative commands: ➢ Found patch 2. ➢ Check all commands marked on patch 2: • Found Matching (associative). ▪ No Action, because matching itself modified patch 2. ▪ Send "Update 3D Handles" notification to Matching. • Found Control Point Modification. ▪ Send "Update 3D Handles" notification to "Control Point Modification". ➢ Finish dynamic step.
10) Move third control point row of patch 2 (dynamic interactive) using one of the line segments of the control point mesh handle, until the result satisfies.	For each dynamic step on modification of patch 2 do: ➢ Check all commands marked on patch 2: • Found Matching (associative). ▪ Activate Matching Action. ▪ Send "Update 3D Handles" notification to Matching. • Found Control Point Modification. ▪ Send "Update 3D Handles" notification to "Control Point". ➢ Look for patches modified by associative commands: ➢ Found patch 2. ➢ Finish dynamic step (patch 2 already handled).

Fig. 4

Class A system with parallel commands, associative commands and scene storage

User	Main Command, Slot
1) Select stored scene.	➢ Reactivate all scene commands (Control Point, Matching, Extrapolation) with associated geometry selections and tool representations from the stored scene.
2) Extrapolate patch 1 (dynamic interactive) by moving the extrapolation handle to the left, until the result satisfies.	For each dynamic step on modification of patch 1 do: ➢ Check all commands marked on patch 1: • Found Matching (associative). ▪ Activate Matching Action. ▪ Mark Patch 2 as modified (by Matching). ▪ Send "Update 3D Handles" notification to Matching. • Found "Control Point Modification". ▪ Send "Update 3D Handles" notification to "Control Point Modification". • Found Extrapolation. ▪ Send "Update 3D Handles" notification to Extrapolation. ➢ Look for patches modified by associative commands: ➢ Found patch 2. ➢ Check all commands marked on patch 2: • Found Matching (associative). ▪ No Action, because matching itself modified patch 2. ▪ Send "Update 3D Handles" notification to Matching. • Found Control Point Modification. ▪ Send "Update 3D Handles" notification to "Control Point Modification". ➢ Finish dynamic step.
3) Move third control point row of patch 2 (dynamic interactive) using one of the line segments of the control point mesh handle, until the result satisfies.	For each dynamic step on modification of patch 2 do: ➢ Check all commands marked on patch 2: • Found Matching (associative). ▪ Activate Matching Action. ▪ Send "Update 3D Handles" notification to Matching. • Found Control Point Modification. ▪ Send "Update 3D Handles" notification to "Control Point". ➢ Look for patches modified by associative commands: ➢ Found patch 2. ➢ Finish dynamic step (patch 2 already handled).

Fig. 5

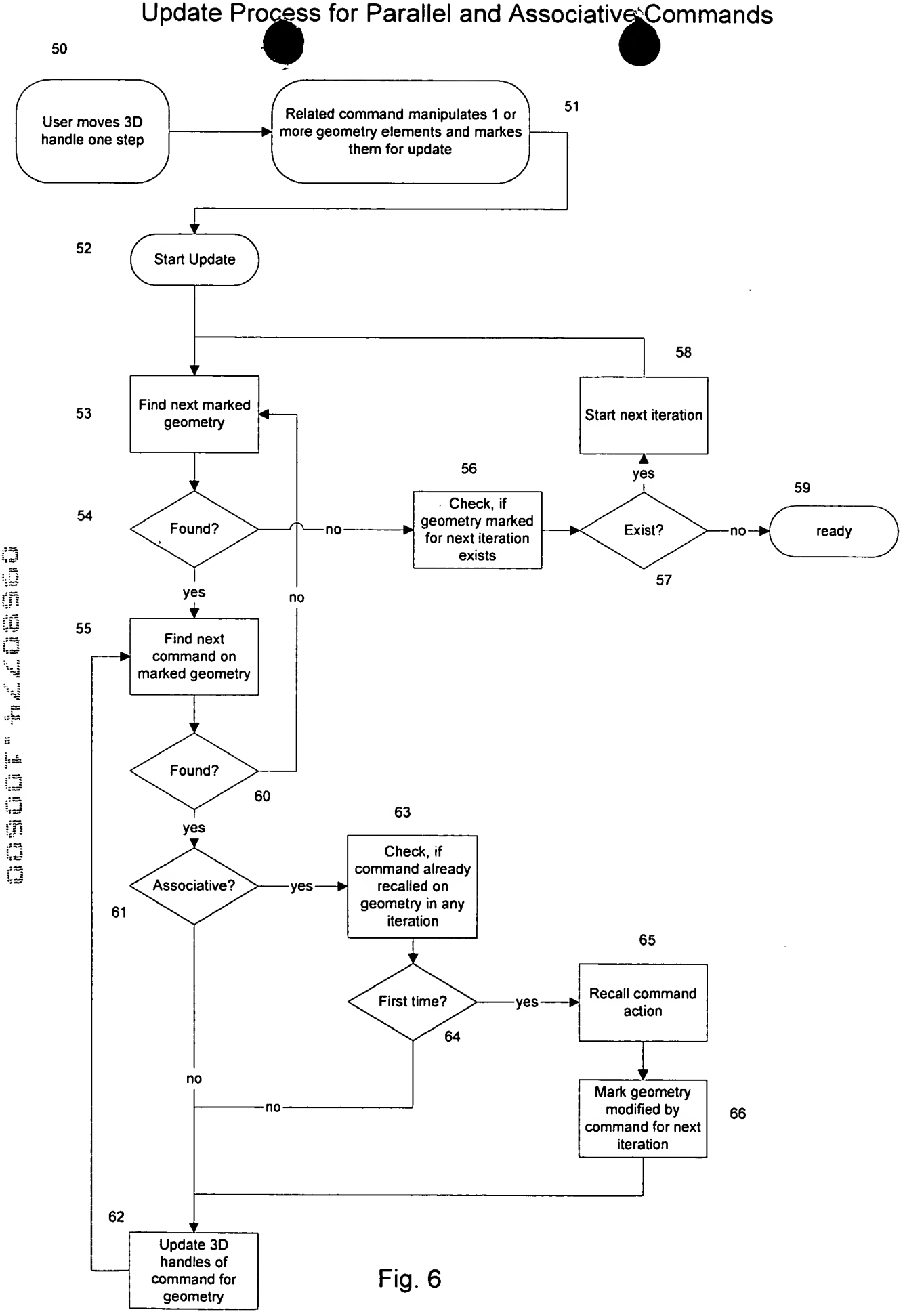
Update Process for Parallel and Associative Commands
50
User moves 3D handle one step
Related command manipulates 1 or more geometry elements and markes them for update
51
52
Start Update
58
Start next iteration
53
Find next marked geometry
56
Check, if geometry marked for next iteration exists
yes
59
54
Found?
no
Exist?
no
ready
57
yes
no
55
Find next command on marked geometry
Found?
60
63
yes
Check, if command already recalled on geometry in any iteration
Associative?
yes
61
65
First time?
yes
Recall command action
64
no
no
Mark geometry modified by command for next iteration
66
62
Update 3D handles of command for geometry

Fig. 6

Substitute Specification

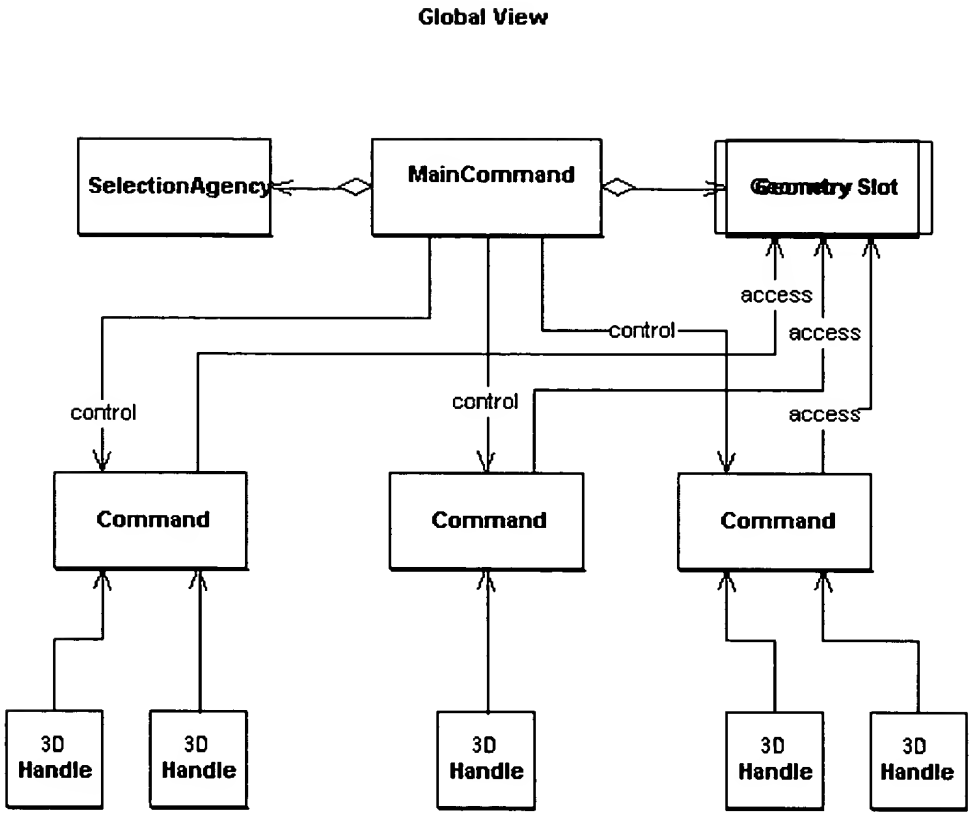

Fig. 7